

REMARKS/ARGUMENTS

Favorable reconsideration of this application, as presently amended and in light of the following discussion, is respectfully requested.

Claims 1-9 and 21-27 are pending in the present application, Claim 20 having been previously canceled.

In the outstanding Office Action, Claims 1-9 and 21-27 were rejected under 35 U.S.C. §103(a) as unpatentable over Leung et al. (U.S. Patent No. 6,653,718, hereinafter Leung) in view of Panicker et al. (U.S. Patent No. 4,942,076, hereinafter Leung).

Applicants respectfully traverse the outstanding ground of rejection because the outstanding Office Action fails to provide a *prima facie* case of obviousness by asserting prior art that, no matter how the prior art references are combined, does not teach every element of independent Claims 1, 8, 16, 18, 21.

To establish a *prima facie* case of obviousness, M.P.E.P. §2143 requires that three criteria must be met. First there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine the references teachings. Second, there must be a reasonable expectation of success. Finally, the prior art references must teach or suggest all the claim elements. The outstanding Office Action is deficient with respect to the first and third requirements.

Leung describes a semiconductor device, in which gap 42 is filled with dielectric layer 46, as shown in Fig. 4. Dielectric layer 46 is a mixture of nanoparticles 47 and matrix material. Another part of the matrix material forms overlayer 48.

Applicants agree with the Office Action that Leung does not teach or suggest “insulating particles being stable at a melting point or a softening point of the reflowable dielectric layer” of Claims 1, 8, 16, 18, and 21.¹

Furthermore, Leung fails to teach or suggest other claim elements.

Leung does not teach or suggest “a particulate insulating layer filling at least a lower portion of the trench and comprising first and second insulating particles, an average diameter of the second insulating particles being smaller than an average diameter of the first insulating particles” of Claim 8. Leung states that “the nanoparticles have a characteristic dimension between 2 nm and about 50 nm.”² Thus, it is clear that Leung does not teach or suggest the above-noted element of Claim 8 or any of the following claim elements:

“an average diameter of the insulating particles falls within a range of 100 nm to 500 nm or a range 100 nm to half a width of opening of the trench” of Claims 7 and 16;

“the average diameter of the first insulating particles and the average diameter of the second insulating particles fall within the range of 100 nm to 500 nm or a range of 100 nm to half a width of opening of the trench” of Claim 15; and

“an average diameter of the first and second insulating particles falls within a range of 100 nm to 500 nm or a range of 100 nm to half a width of opening of the trench” of Claim 25.

Leung also does not teach or suggest “a particulate insulating layer...comprising...an insulating binder that bonds the insulating particles together, the insulating particles and the insulating binder forming a network structure” of Claims 16 and 18.

Leung also does not teach or suggest “a particulate insulating layer filling at least a lower portion of the trench and including first and second particulate insulating layers, the first particulate insulating layer comprising first insulating particles with no binder, and the second particulate insulating layer covering an upper surface of the first particulate layer and

¹ Office Action, page 3.

² Leung, col. 4, lines 40-41.

comprising second insulating particles and an insulating binder” of Claim 21. The outstanding Office Action provides no support for the assertion that the combination of Leung and Panicker teach or suggest the above-noted elements of Claim 21.

Leung also does not teach or suggest “a cap insulating layer covering an upper surface of the reflowable dielectric layer and having a melting point or a softening point higher than the melting point or the softening point of the reflowable dielectric layer” of Claims 4, 13, 19, and 24. The outstanding Office Action provides no support for the assertion that the combination of Leung and Panicker teach or suggest the above-noted elements of Claims 4, 13, 19, and 24.

In the semiconductor device describe by Leung, an upper surface of dielectric layer 46 is higher than an upper surface of substrate 45, as shown in Fig. 4. Thus, Leung clearly does not teach or suggest a semiconductor device with “an upper surface of the particulate layer is lower than an upper surface of the semiconductor substrate” of Claim 6.

As noted above, Leung is deficient in many respects in addition to not teaching or suggesting “the insulating particles being stable at a melting point or softening point of the reflowable dielectric layer.”

Panicker does not cure the above-noted deficiencies of Leung. The outstanding Office Action relies on Claims 10-17 of Panicker to describe stability at the melting point.³ However, Claims 10-17 of Panicker are directed to a composite metal. Panicker describes that the composite metal performs a function of grounding microwave components and other electronic components, and carrying away heat generated within the components.⁴ A composite metal having such a function has no relation to the insulating layer that fills a trench.

³ Office Action, page 2.

⁴ Panicker, col. 1, lines 34-36.

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Furthermore, because the composite metal of Panicker has no relation to the insulating layer that fills the trench, Applicants respectfully traverse the position taken in the outstanding Office Action that increasing reliability of a semiconductor device would motivate a skilled artisan to combine Leung and Panicker.

In view of the above-noted distinctions, Applicants respectfully submit that Claims 1-19 and 21-27 patentably distinguish over Leung and Panicker, alone or in combination.

Consequently, in light of the above discussion and in view of the present amendment, the present application is believed to be in condition for allowance and an early and favorable action to that effect is respectfully requested.

Respectfully submitted,

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